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(54) Title: LIGHT DUTY LIQUID CLEANING COMPOSITIONS (57) Abstract <p>A light duty liquid detergent with desirable cleansing properties and mildness to the human skin comprising: at least one sulfonate surfactant, an alkali metal or ammonium salt of a C₈₋₁₈ ethoxylated alkyl ether sulfate anionic surfactant, a sultaine surfactant, an alkyl polyglucoside surfactant, and optionally a betaine surfactant, an amine oxide surfactant, an alkyl C₁₂-C₁₄ monoalkanol amide and/or an ethoxylated C₁₂-C₁₄ monoalkanol amide and water.</p>		

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LIGHT DUTY LIQUID CLEANING COMPOSITIONS

Field of the Invention

This invention relates to a light duty liquid cleaning composition which imparts enhanced mildness to the skin and improved foam properties and is designed in particular for dishware and which is effective in removing grease soil and in leaving rinsed surfaces with a shiny appearance.

Background of the Invention

The present invention relates to novel light duty liquid detergent compositions with high foaming properties, containing at least one sulfonate surfactant, an ammonium or alkali metal salt of an ethoxylated alkyl ether sulfate surfactant, an alkyl polyglucoside surfactant, a sultaine surfactant, and, optionally, an amine oxide, betaine surfactant, an ethoxylated alkyl monoalkanol amide and/or an alkyl monoalkanol amide and water.

The prior art is replete with light duty liquid detergent compositions containing nonionic surfactants in combination with anionic and/or betaine surfactants wherein the nonionic detergent is not the major active surfactant, as shown in U.S. Patent No.

3,658,985 wherein an anionic based shampoo contains a minor amount of a fatty acid alkanolamide. U.S. Patent No. 3,769,398 discloses a betaine-based shampoo containing minor amounts of nonionic surfactants. This patent states that the low foaming properties of nonionic detergents renders its use in shampoo compositions non-preferred. U.S. Patent No. 4,329,335 also discloses a shampoo containing a betaine surfactant as the major ingredient and minor amounts of a nonionic surfactant and of a fatty acid mono- or di-ethanolamide. U.S. Patent No. 4,259,204 discloses a shampoo comprising 0.8-20% by weight of an anionic phosphoric acid ester and one additional surfactant which may be either anionic, amphoteric, or nonionic. U.S. Patent No. 4,329,334 discloses an anionic-amphoteric based shampoo containing a major amount of anionic surfactant and lesser amounts of a betaine and nonionic surfactants.

U.S. Patent No. 3,935,129 discloses a liquid cleaning composition based on the alkali metal silicate content and containing five basic ingredients, namely, urea, glycerin, triethanolamine, an anionic detergent and a nonionic detergent. The silicate content determines the amount of anionic and/or nonionic detergent in the liquid
5 cleaning composition. However, the foaming property of these detergent compositions is not discussed therein.

U.S. Patent No. 4,129,515 discloses a heavy duty liquid detergent for laundering fabrics comprising a mixture of substantially equal amounts of anionic and nonionic surfactants, alkanolamines and magnesium salts, and, optionally, zwitterionic
10 surfactants as suds modifiers.

U.S. Patent No. 4,224,195 discloses an aqueous detergent composition for laundering socks or stockings comprising a specific group of nonionic detergents, namely, an ethylene oxide of a secondary alcohol, a specific group of anionic detergents, namely, a sulfuric ester salt of an ethylene oxide adduct of a secondary
15 alcohol, and an amphoteric surfactant which may be a betaine, wherein either the anionic or nonionic surfactant may be the major ingredient.

The prior art also discloses detergent compositions containing all nonionic surfactants as shown in U.S. Patent Nos. 4,154,706 and 4,329,336 wherein the shampoo compositions contain a plurality of particular nonionic surfactants in order to
20 effect desirable foaming and deterative properties despite the fact that nonionic surfactants are usually deficient in such properties.

U.S. Patent No. 4,013,787 discloses a piperazine based polymer in conditioning and shampoo compositions which may contain all nonionic surfactant or all anionic surfactant.

25 U.S. Patent 4,671,895 teaches a liquid detergent composition containing an alcohol sulfate surfactant, a nonionic surfactant, a paraffin sulfonate surfactant, an alkyl ether sulfate surfactant and water.

U.S. Patent No. 4,450,091 discloses high viscosity shampoo compositions containing a blend of an amphoteric betaine surfactant, a polyoxybutylene

polyoxyethylene nonionic detergent, an anionic surfactant, a fatty acid alkanolamide and a polyoxyalkylene glycol fatty ester. But, none of the exemplified compositions contains an active ingredient mixture wherein the nonionic detergent is present in major proportion, probably due to the low foaming properties of the polyoxybutylene polyoxyethylene nonionic detergent.

U.S. Patent No. 4,595,526 describes a composition comprising a nonionic surfactant, a betaine surfactant, an anionic surfactant and a C₁₂-C₁₄ fatty acid monoethanolamide foam stabilizer.

U.S. Patent Nos. 4,675,422; 4,698,181; 4,724,174; 4,770,815 and 4,921,942 disclose alkyl succinamates but the compositions are non related to light duty liquid compositions.

However, none of the above-cited patents discloses a liquid detergent composition containing at least one sulfonate surfactant, an alkali metal or ammonium salt of an ethoxylated alkyl ether sulfate surfactant, an alkyl polyglucoside surfactant, and optionally, an amine oxide surfactant, betaine surfactant, an alkyl monoalkanol amide and/or an ethoxylated alkyl monoalkanol amide, and water, wherein the composition does not contain any low molecular weight mono- or di-glucoside, abrasives, silicas, alkaline earth metal carbonates, alkyl glycine surfactant, cyclic imidinium surfactant, alkali metal carbonates or more than 3 wt. % of a fatty acid or its salt thereof.

Additionally, none of the above-cited patents discloses a liquid detergent composition containing at least one sulfonate surfactant, an alkali metal or ammonium salt of an ethoxylated alkyl ether sulfate surfactant, an alkyl polyglucoside surfactant, a betaine surfactant, an ethoxylated alkyl monoalkanol amide and water, wherein the composition does not contain any low molecular weight mono- or di-glucoside, abrasives, silicas, alkaline earth metal carbonates, alkyl glycine surfactant, cyclic imidinium surfactant, alkali metal carbonates or more than 3 wt. % of a fatty acid or its salt thereof.

Summary of the Invention

It has now been found that a light duty liquid composition can be made which has desirable cleaning properties together with enhanced mildness to the human skin.

An object of this invention is to provide a novel light duty liquid detergent
5 composition containing at least one sulfonate surfactant, an alkali metal salt or ammonium salt of an ethoxylated alkyl ether sulfate surfactant, an alkyl polyglucoside surfactant, and, optionally, an amine oxide surfactant, betaine surfactant, an alkyl monoalkanol amide and/or an ethoxylated alkyl monoalkanol amide, and water wherein the composition does not contain any silicas, abrasives, alkali metal carbonates,
10 alkaline earth metal carbonates, alkyl glycine surfactant, cyclic imidinium surfactant, low molecular weight mono- or di-glucoside organoaluminum containing compounds, organo titanium containing compounds, triethylene tetramine hexaacetic acid, imidazolenes, or more than 3 wt. % of a fatty acid or salt thereof.

Another object of this invention is to provide a novel light duty liquid detergent
15 composition containing two sulfonate surfactants, an alkali metal salt or ammonium salt of an ethoxylated alkyl ether sulfate surfactant, an alkyl polyglucoside surfactant, a betaine surfactant, an ethoxylated alkyl monoalkanol amide and water wherein the composition does not contain any silicas, abrasives, alkali metal carbonates, alkaline
earth metal carbonates, alkyl glycine surfactant, cyclic imidinium surfactant, low
20 molecular weight mono- or di-glucoside organoaluminum containing compounds, organo titanium containing compounds, triethylene tetramine hexaacetic acid, imidazolenes, or more than 3 wt. % of a fatty acid or salt thereof.

Another object of this invention is to provide a novel light duty liquid detergent with desirable high foaming and cleaning properties which is very mild to the human
25 skin.

Additional objects, advantages and novel features of the invention will be set forth in part in the description which follows, and in part will become apparent to those skilled in the art upon examination of the following or may be learned by practice of the invention. The objects and advantages of the invention may be realized and attained

by means of the instrumentalities and combinations particularly pointed out in the appended claims.

Detailed Description of the Invention

The light duty liquid compositions of the instant invention comprise by weight:

5 (a) 8% to 14% of an alkali metal salt or ammonium salt of a C8-18

ethoxylated alkyl ether sulfate;

(b) 8% to 14% of at least one sulfonate surfactant;

(c) 0 to 6% of an amine oxide surfactant;

(d) 0 to 3% of a C₁₂-C₁₄ alkyl monoalkanol amide;

10 (e) 0% to 2% of an ethoxylated alkyl monoalkanol amide;

(f) 8% to 14% of an alkyl polyglucoside surfactant;

(g) 0 to 8% of a betaine surfactant;

(h) 1 to 10 wt. % of a sultaine surfactant; and

(i) the balance being water.

15 The light duty liquid compositions of the instant invention also comprise by weight:

(a) 4% to 12% of an alkali metal salt or ammonium salt of a C8-18

ethoxylated alkyl ether sulfate;

20 (b) 6% to 10% of a first sulfonate surfactant which is a magnesium salt of a linear alkyl benzene sulfonate surfactant;

(c) 4% to 8% of a betaine surfactant;

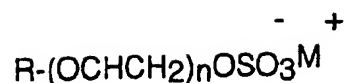
(d) 0.5% to 2% of an ethoxylated alkyl monoalkanol amide;

(e) 8% to 12% of an alkyl polyglucoside surfactant;

25 (f) 1% to 4% of a second sulfonate surfactant which is an alkali metal salt of a linear alkyl benzene sulfonate; and

(g) the balance being water.

The C8-18 ethoxylated alkyl ether sulfate surfactants used in the instant composition have the structure:



wherein n is 1 to 22 more preferably 1 to 3 and R is an alkyl group having 8 to 18 carbon atoms, more preferably 12 to 15 and natural cuts, for example, C12-14; C12-15 and M is an ammonium cation or an alkali metal cation, most preferably sodium or ammonium. The ethoxylated alkyl ether sulfate is present in the composition at a concentration of 8 wt. % to 24 wt. %, more preferably 10 wt. % to 22 wt. %.

The ethoxylated alkyl ether sulfate may be made by sulfating the condensation product of ethylene oxide and C8-10 alkanol, and neutralizing the resultant product.

The ethoxylated alkyl ether sulfates differ from one another in the number of carbon atoms in the alcohols and in the number of moles of ethylene oxide reacted with one mole of such alcohol. Preferred ethoxylated alkyl ether polyethenoxy sulfates contain 12 to 15 carbon atoms in the alcohols and in the alkyl groups thereof, e.g., sodium myristyl (3 EO) sulfate.

Ethoxylated C8-18 alkylphenyl ether sulfates containing from 2 to 6 moles of ethylene oxide in the molecule are also suitable for use in the invention compositions. These detergents can be prepared by reacting an alkyl phenol with 2 to 6 moles of ethylene oxide and sulfating and neutralizing the resultant ethoxylated alkylphenol.

In one aspect, the instant composition contains a mixture of a first sulfonate surfactant which is a magnesium salt of a linear C8-C16 alkyl benzene sulfonate such as a magnesium salt of a linear dodecyl benzene sulfonate and a second sulfonate surfactant which is an alkali metal salt of a linear C8-C16 alkyl benzene sulfonate such as the sodium salt of linear dodecyl benzene sulfonate. The concentration of the magnesium salt of the linear C8-C16 alkyl benzene sulfonate is 6 wt. % to 10 wt. %, more preferably 6 wt. % to 9 wt. %. The concentration of the alkali metal salt of the alkali metal salt of the linear C8-C16 alkyl benzene sulfonate is 1 to 4 wt. %, more preferably 1.5 wt. % to 4 wt. %.

In another aspect, the instant composition contains at least one sulfonate surfactant which is a magnesium and/or sodium salt of a linear C8-C16 alkyl benzene

sulfonate such as a magnesium or sodium salt of a linear dodecyl benzene sulfonate or a C₁₃-C₁₇ paraffin surfactant which is an alkali metal salt or magnesium salt of a C₁₃-C₁₇ sulfonate such as the sodium salt of C₁₃-C₁₇ paraffin sulfonate. The concentration of the magnesium salt of the sulfonate surfactant is 8 wt. % to 14 wt. %, more preferably 10 wt. % to 13 wt. %.

The linear alkyl benzene sulfonates can contain from 10 to 16 carbon atoms in the alkyl group are used in the instant compositions wherein the alkyl benzene sulfonate has a high content of 3- (or higher) phenyl isomers and a correspondingly low content (well below 50%) of 2- (or lower) phenyl isomers, that is, wherein the benzene ring is preferably attached in large part at the 3 or higher (for example, 4, 5, 6 or 7) position of the alkyl group.

The alkyl polysaccharides surfactants, which are used in conjunction with the aforementioned surfactant have a hydrophobic group containing from 8 to 20 carbon atoms, preferably from 10 to 16 carbon atoms, most preferably from 12 to 14 carbon atoms, and polysaccharide hydrophilic group containing from 1.5 to 10, preferably from 1.5 to 4, most preferably from 1.6 to 2.7 saccharide units (e.g., galactoside, glucoside, fructoside, glucosyl, fructosyl; and/or galactosyl units). Mixtures of saccharide moieties

may be used in the alkyl polysaccharide surfactants. The number x indicates the number of saccharide units in a particular alkyl polysaccharide surfactant. For a particular alkyl polysaccharide molecule x can only assume integral values. In any physical sample of alkyl polysaccharide surfactants there will be in general molecules having different x values. The physical sample can be characterized by the average value of x and this average value can assume non-integral values. In this specification the values of x are to be understood to be average values. The hydrophobic group (R) can be attached at the 2-, 3-, or 4- positions rather than at the 1-position, (thus giving e.g. a glucosyl or galactosyl as opposed to a glucoside or galactoside). However, attachment through the 1- position, i.e., glucosides, galactoside, fructosides, etc., is preferred. In the preferred product the additional saccharide units are predominately attached to the previous saccharide unit's 2-position. Attachment through the 3-, 4-,

and 6- positions can also occur. Optionally and less desirably there can be a polyalkoxide chain joining the hydrophobic moiety (R) and the polysaccharide chain. The preferred alkoxide moiety is ethoxide.

Typical hydrophobic groups include alkyl groups, either saturated or
5 unsaturated, branched or unbranched containing from 8 to 20, preferably from 10 to 18 carbon atoms. Preferably, the alkyl group is a straight chain saturated alkyl group. The alkyl group can contain up to 3 hydroxy groups and/or the polyalkoxide chain can contain up to 30, preferably less than 10, alkoxide moieties.

Suitable alkyl polysaccharides are decyl, dodecyl, tetradecyl, pentadecyl,
10 hexadecyl, and octadecyl, di-, tri-, tetra-, penta-, and hexagluco-
sides, galactosides, lactosides, fructosides, fructosyls, lactosyls, glucosyls and/or galactosyls and mixtures thereof.

The alkyl monosaccharides are relatively less soluble in water than the higher alkyl polysaccharides. When used in admixture with alkyl polysaccharides, the alkyl
15 monosaccharides are solubilized to some extent. The use of alkyl monosaccharides in admixture with alkyl polysaccharides is a preferred mode of carrying out the invention. Suitable mixtures include coconut alkyl, di-, tri-, tetra-, and pentagluco-
sides and tallow alkyl tetra-, penta-, and hexagluco-
sides.

The preferred alkyl polysaccharides are alkyl polyglucosides having the formula
20
$$RO(C_nH_{2n}O)_r(Z)_x$$

wherein Z is derived from glucose, R is a hydrophobic group selected from the group consisting of alkyl, alkylphenyl, hydroxyalkylphenyl, and mixtures thereof in which said alkyl groups contain from 10 to 18, preferably from 12 to 14 carbon atoms; n is 2 or 3 preferably 2, r is from 0 to 10, preferably 0; and x is from 1.5 to 8, preferably from 1.5 to
25 4, most preferably from 1.6 to 2.7. To prepare these compounds a long chain alcohol (R₂OH) can be reacted with glucose, in the presence of an acid catalyst to form the desired glucoside. Alternatively the alkyl polyglucosides can be prepared by a two step procedure in which a short chain alcohol (R₁OH) can be reacted with glucose, in the presence of an acid catalyst to form the desired glucoside. Alternatively the alkyl

polyglucosides can be prepared by a two step procedure in which a short chain alcohol (C₁₋₆) is reacted with glucose or a polyglucoside (x=2 to 4) to yield a short chain alkyl glucoside (x=1 to 4) which can in turn be reacted with a longer chain alcohol (R₂OH) to displace the short chain alcohol and obtain the desired alkyl polyglucoside. If this two
5 step procedure is used, the short chain alkylglucoside content of the final alkyl polyglucoside material should be less than 50%, preferably less than 10%, more preferably less than 5%, most preferably 0% of the alkyl polyglucoside.

The amount of unreacted alcohol (the free fatty alcohol content) in the desired alkyl polysaccharide surfactant is preferably less than 2%, more preferably less than
10 0.5% by weight of the total of the alkyl polysaccharide. For some uses it is desirable to have the alkyl monosaccharide content less than 10%.

The used herein, "alkyl polysaccharide surfactant" is intended to represent both the preferred glucose and galactose derived surfactants and the less preferred alkyl polysaccharide surfactants. Throughout this specification, "alkyl polyglucoside" is used
15 to include alkyl polyglycosides because the stereochemistry of the saccharide moiety is changed during the preparation reaction.

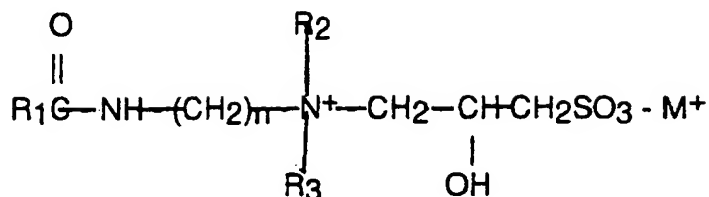
An especially preferred APG glycoside surfactant is Glucopon 625 glycoside manufactured by the Henkel Corporation of Ambler, PA. Glucopon 625 is a nonionic alkyl polyglycoside characterized by the formula:



wherein n=10 (2%); n=12 (65%); n=14 (21-28%); n=16 (4-8%) and n=18 (0.5%) and x (degree of polymerization) = 1.6. Glucopon 625 has: a pH of 6 to 10 (10% of Glucopon 625 in distilled water); a specific gravity at 25°C of 1.1 g/ml; a density at 25°C of 9.1 lbs/gallon; a calculated HLB of 12.1 and a Brookfield viscosity at 35°C, 21
25 spindle, 5-10 RPM of 3,000 to 7,000 cps.

The composition contains 1% to 10 wt %, more preferably 1.5 to 8 wt % of a sultaine which is preferably a cocoamido-propylhydroxy sultaine. The sultaine can be depicted by the formula:

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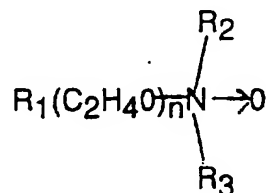


5

wherein R₁ is a saturated or unsaturated alkyl group having 6 to 24 carbon atoms, R₂ is a methyl or ethyl group, R₃ is a methyl or ethyl group, n is 1 to 6, and M⁺ is an alkali metal cation. The most preferred hydroxysultaine is a potassium salt of cocoamidopropyl hydroxysultaine.

10

Amine oxide semi-polar nonionic surfactants optionally, used in the instant compositions comprise compounds and mixtures of compounds having the formula:

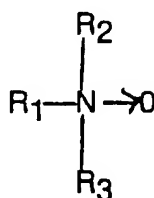


15

wherein R₁ is an alkyl, 2-hydroxyalkyl, 3-hydroxyalkyl, or 3-alkoxy-2-hydroxypropyl radical in which the alkyl and alkoxy, respectively, contain from 8 to 18 carbon atoms, R₂ and R₃ are each methyl, ethyl, propyl, isopropyl, 2-hydroxyethyl, 2-hydroxypropyl,

20

or 3-hydroxypropyl, and n is from 0 to 10. Particularly preferred are amine oxides of the formula:



25

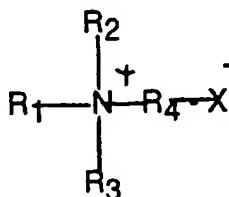
wherein R₁ is a C₁₂₋₁₆ alkyl, or cocoamidopropyl group and R₂ and R₃ are methyl or ethyl. The above ethylene oxide condensates, amides, and amine oxides are more fully described in U.S. Pat. No. 4,316,824 which is hereby incorporated herein by reference.

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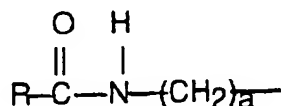
Preferred amine oxides are lauryl amine oxide and cocoamido propyl amine oxide.

The concentration of the amine oxide in the instant compositions is 0 to 6 wt. %, more preferably 0.5 to 5 wt. %.

The instant composition can contain a water-soluble zwitterionic surfactant. The zwitterionic surfactant is a water soluble betaine having the general formula:



wherein X^- is selected from the group consisting of CO_2^- and SO_3^- and R_1 is an alkyl group having 10 to 20 carbon atoms, preferably 12 to 16 carbon atoms, or the amido radical:



wherein R is an alkyl group having 9 to 19 carbon atoms and a is the integer 1 to 4; R_2 and R_3 are each alkyl groups having 1 to 3 carbons and preferably 1 carbon; R_4 is an alkylene or hydroxyalkylene group having from 1 to 4 carbon atoms and, optionally, one hydroxyl group. Typical alkyldimethyl betaines include decyl dimethyl betaine or 2-(N-decyl-N, N-dimethyl-ammonia) acetate, coco dimethyl betaine or 2-(N-coco N, N-dimethylammonia) acetate, myristyl dimethyl betaine, palmityl dimethyl betaine, lauryl

dimethyl betaine, cetyl dimethyl betaine, stearyl dimethyl betaine, etc. The amidobetaines similarly include cocoamidoethylbetaine, cocoamidopropyl betaine and the like. A preferred betaine is coco (C_8 - C_{18}) amidopropyl dimethyl betaine. Two preferred betaine surfactants are Rewoteric AMB 14U and Goldschmidt Betaine L7.

The instant compositions can contain a C_{12} - C_{14} alkyl monoalkanol amide such as lauryl monoalkanol amide (LMMEA). The instant compositions can contain an ethoxylated C_{12} - C_{14} alkyl monoalkanol amide containing 1 to 6 ethoxylated groups such as PEG-6 lauramide and preferably the alkanol portion is ethanol.

The instant compositions contain 0 wt. % to 12 wt. %, more preferably 1 wt. % to 10 wt. %, of at least one solubilizing agent which can be sodium xylene sulfonate, sodium cumene sulfonate, a C_2 -3 mono or dihydroxy alkanols such as ethanol, isopropanol and propylene glycol and mixtures thereof. The solubilizing agents are

included in order to control low temperature cloud clear properties. Urea can be optionally employed in the instant composition as a supplemental solubilizing agent at a concentration of 0 to 10 wt. %, more preferably 0.5 wt. % to 8 wt. %.

Other solubilizing agents are glycerol, water-soluble polyethylene glycols having
5 a molecular weight of 300 to 600, polypropylene glycol of the formula
 $\text{HO}(\text{CH}_2\text{CHCH}_2\text{O})_n\text{H}$ wherein n is a number from 2 to 18, mixtures of polyethylene
glycol and polypropylene glycol (Synalox) and mono C_1 - C_6 alkyl ethers and esters of
ethylene glycol and propylene glycol having the structural formulas $\text{R}(\text{X})_n\text{OH}$ and
 $\text{R}_1(\text{X})_n\text{OH}$ wherein R is C_1 - C_6 alkyl group, R_1 is C_2 - C_4 acyl group, X is $(\text{OCH}_2\text{CH}_2)$
10 or $(\text{OCH}_2(\text{CH}_3)\text{CH})$ and n is a number from 1 to 4.

Representative members of the polypropylene glycol include dipropylene glycol
and polypropylene glycol having a molecular weight of 200 to 1000, e.g., polypropylene
glycol 400. Other satisfactory glycol ethers are ethylene glycol monobutyl ether (butyl
cellosolve), diethylene glycol monobutyl ether (butyl carbitol), triethylene glycol
15 monobutyl ether, mono, di, tri propylene glycol monobutyl ether, tetraethylene glycol
monobutyl ether, mono, di, tripropylene glycol monomethyl ether, propylene glycol
monomethyl ether, ethylene glycol monohexyl ether, diethylene glycol monohexyl
ether, propylene glycol tertiary butyl ether, ethylene glycol monoethyl ether, ethylene
glycol monomethyl ether, ethylene glycol monopropyl ether, ethylene glycol
20 monopentyl ether, diethylene glycol monomethyl ether, diethylene glycol monoethyl
ether, diethylene glycol monopropyl ether, diethylene glycol monopentyl ether,
triethylene glycol monomethyl ether, triethylene glycol monoethyl ether, triethylene
glycol monopropyl ether, triethylene glycol monopentyl ether, triethylene glycol
monohexyl ether, mono, di, tripropylene glycol monoethyl ether, mono, di tripropylene
25 glycol monopropyl ether, mono, di, tripropylene glycol monopentyl ether, mono, di,
tripropylene glycol monohexyl ether, mono, di, tributylene glycol mono methyl ether,
mono, di, tributylene glycol monoethyl ether, mono, di, tributylene glycol monopropyl
ether, mono, di, tributylene glycol monobutyl ether, mono, di, tributylene glycol

monopentyl ether and mono, di, tributylene glycol monohexyl ether, ethylene glycol monoacetate and dipropylene glycol propionate.

The instant composition can contain 0 to 10 wt. %, more preferably 1 to 8 wt. % of an alpha sulfomethylester of a C₁₂-C₁₆ fatty acid such as a coco fatty acid.

5 The instant composition can also contain 0 to 6 wt. %, more preferably 0.5 wt. % to 5 wt. % of an inorganic magnesium containing compound such as magnesium sulfate heptahydrate.

10 The instant formulas explicitly exclude alkali metal silicates and alkali metal builders such as alkali metal polyphosphates, alkali metal carbonates, alkali metal phosphonates and alkali metal citrates because these materials, if used in the instant composition, would cause the composition to have a high pH as well as leaving residue on the surface being cleaned. The final essential ingredient in the inventive compositions having improved interfacial tension properties is water.

15 In final form, the instant compositions exhibit stability at reduced and increased temperatures. More specifically, such compositions remain clear and stable in the range of 5°C to 50°C, especially 10°C to 43°C. The instant compositions have a light transmission of at least 95%. Such compositions exhibit a pH of 5 to 8. The liquid compositions are readily pourable and exhibit a viscosity in the range of 100 to 600 cps as measured at 25°C. with a Brookfield RVT Viscometer using a #2 spindle rotating at
20 30 RPM. Preferably, the viscosity is maintained in the range of 300 to 500 cps. The instant compositions have a minimum foam height of 200 mls after 40 rotation at 25°C as measured by the foam volume test using 0.0335 wt. % of the composition in 150 ppm of water. The foam test is an inverted cylinder test in which 100 ml. of a 0.033 wt. % LDL formula in 150 ppm of H₂O is placed in a stoppered graduate cylinder (500
25 ml) and inverted 40 cycles at a rate of 30 cycles/minute. After 40 inversions, the foam volume which has been generated is measured in mls inside the graduated cylinder. This value includes the 100 ml of LDL solution inside the cylinder.

The following examples illustrate liquid cleaning compositions of the described invention. Unless otherwise specified, all percentages are by weight. The exemplified

compositions are illustrative only and do not limit the scope of the invention. Unless otherwise specified, the proportions in the examples and elsewhere in the specification are by weight.

Example 1

- 5 The following compositions in wt. % were prepared by simple mixing procedure at 25°C:

	A	B	C	D	E	F
Magnesium linear alkyl benzene sulfonate	9.00	9.00	7.66	7.66	10.7	10.7
Sodium linear alkyl benzene sulfonate	3.00	3.00	3.0	3.0		
AEOS 2.0EO					11.3	11.3
AEOS 1.3EO	11.64	11.64	8.65	8.65		
LMMEA					1.3	1.3
APG625	10.0	10.0	10	10	10.4	10.4
Cocoamido propyl betaine				6.0		
PEG-6 lauramide			0.92	0.92		
Cocoamido propyl hydroxy sultaine	6.34		6.0		7.6	
Cocoamido propyl amine oxide		6.34	3.78	3.78		7.60
Sodium xylene sulfonate	0.9	0.9	0.9	0.9	0.9	0.9
Water	bal	bal	bal	bal	bal	bal
Foam vol.	373	358	360	347	373	353

Example 1

The following compositions in wt. % were prepared by simple mixing procedure at 25°C:

	A	B	C
Magnesium linear alkyl benzene sulfonate	7.66	7.4	7.4
Sodium linear alkyl benzene sulfonate	3.00	2.9	2.9
AEOS 1.3EO	8.65	8.4	8.4
APG625	10.0	9.7	9.7
PEG-6 lauramide	0.92	0.9	0.9
Alkyl amine oxide			3.7
Cocoamido propyl amine oxide	3.78	3.7	
Cocoamido propyl betaine	6.00	5.6	5.8
Ethanol		3.4	3.4
Sodium xylene sulfonate	0.9	0.2	0.45
Water	bal	bal	bal
Foam vol. (ml)	347	348	302

What Is Claimed:

1. A clear light duty liquid cleaning composition which comprises by weight:
 - (a) 8% to 14% of an alkali metal or ammonium salt of a C₈-18 ethoxylated alkyl ether sulfate;
 - 5 (b) 1% to 10% of a sultaine surfactant;
 - (c) 8% to 14% of at least one sulfonate surfactant;
 - (d) 0 to 12% of at least one solubilizing agent;
 - (e) 8% to 14% of an alkyl polyglucoside surfactant; and
 - (f) the balance being water.
- 10 2. The composition of Claim 1, wherein said solubilizing agent is a C₂-4 mono or dihydroxy alkanol.
3. The composition of Claim 1, wherein said solubilizing agent is selected from the group consisting of isopropanol, ethanol and propylene glycol and mixtures thereof.
- 15 4. The composition of Claim 1, wherein said solubilizing agent is selected from the group consisting of glycerol, polyethylene glycols, polypropylene glycol of the formula $\text{HO}(\text{CH}_2\text{CHCH}_2\text{O})_n\text{H}$, wherein n is 2 to 18, mono C₁-C₆ alkyl ethers and

esters of ethylene glycol and propylene glycol having the formulas of $\text{R}(\text{X})_n\text{OH}$ and $\text{R}_1(\text{X})_n\text{OH}$ wherein R is a C₁-6 alkyl group, R₁ is a C₂-4 acyl group, X is (OCH₂CH₂)
20 or (OCH₂CHCH₃) and n is from 1 to 4.
5. The composition according to Claim 1, further including 0.5 to 2.5 wt. % of a C₁₂-C₁₄ alkyl monoalkanol amide.
6. The composition according to Claim 1, further including 0.5 to 6.0 wt. % of a betaine surfactant.
- 25 7. The composition according to Claim 1, further including 0.25 to 1.75 wt. % of an ethoxylated C₁₂-C₁₄ alkyl monoalkanol amide.
8. The composition according to Claim 1, further including 0.5 to 5.0 wt. % of an amine oxide surfactant.

9. The composition according to Claim 8, further including 0.25 to 1.75 wt. % of an ethoxylated C₁₂-C₁₄ alkyl monoalkanol amide.

10. A clear light duty liquid cleaning composition which comprises by weight:

(a) 4% to 12% of an alkali metal or ammonium salt of a C₈-18 ethoxylated alkyl ether sulfate;

(b) 4% to 8% of a betaine surfactant;

(c) 1% to 4% of an alkali metal salt of a linear C₈-C₁₆ alkyl benzene sulfonate surfactant;

(d) 0% to 12% of at least one solubilizing agent;

10 (e) 8% to 12% of an alkyl polyglucoside surfactant;

(f) 0.5% to 2% of an ethoxylated C₁₂-C₁₄ alkyl monoalkanol amide;

(g) 6% to 10% of a magnesium salt of a linear C₈-C₁₆ alkyl benzene

sulfonate surfactant; and

(h) the balance being water.

15 11. The composition of Claim 10, wherein said solubilizing agent is a C₂-4 mono or dihydroxy alkanol.

12. The composition of Claim 10, wherein said solubilizing agent is selected from the group consisting of isopropanol, ethanol and propylene glycol and mixtures thereof.

20 13. The composition of Claim 10, wherein said solubilizing agent is selected from the group consisting of glycerol, polyethylene glycols, polypropylene glycol of the formula $\text{HO}(\text{CH}_2\text{CHCH}_2\text{O})_n\text{H}$, wherein n is 2 to 18, mono C₁-C₆ alkyl ethers and esters of ethylene glycol and propylene glycol having the formulas of $\text{R}(\text{X})_n\text{OH}$ and $\text{R}_1(\text{X})_n\text{OH}$ wherein R is a C₁-6 alkyl group, R₁ is a C₂-4 acyl group, X is $(\text{OCH}_2\text{CH}_2)$ or $(\text{OCH}_2\text{CHCH}_3)$ and n is from 1 to 4.

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14. The composition of Claim 10, further including an amine oxide surfactant.

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶ : C11D 1/94 // C11D 1:29, 1:92, 1:12, 1:66, 1:52, 1:90, 1:75		A3	(11) International Publication Number: WO 98/05745						
			(43) International Publication Date: 12 February 1998 (12.02.98)						
<p>(21) International Application Number: PCT/US97/13639</p> <p>(22) International Filing Date: 5 August 1997 (05.08.97)</p> <p>(30) Priority Data:</p> <table><tr><td>08/700,330</td><td>8 August 1996 (08.08.96)</td><td>US</td></tr><tr><td>08/700,331</td><td>8 August 1996 (08.08.96)</td><td>US</td></tr></table> <p>(71) Applicant: COLGATE-PALMOLIVE COMPANY [US/US]; 300 Park Avenue, New York, NY 10022 (US).</p> <p>(72) Inventors: GORLIN, Philip, A.; 4504 Twin Oaks Court, Monmouth Junction, NJ 08852 (US). GAMBOGI, Joan, E.; 5 Manor Drive, Belle Mead, NJ 08502 (US). D'AMBROGIO, Robert; 615 Betsy Ross Place, Bound Brook, NJ 08805 (US). JAKUBICKI, Gary; 7 Millburne Lane, Robbinsville, NJ 08691 (US). ZYZYCK, Leonard; 25 Honeysuckle Court, Skillman, NJ 08558 (US).</p> <p>(74) Agent: NANFELDT, Richard, E.; Colgate-Palmolive Company, 909 River Road, Piscataway, NJ 08855-1343 (US).</p>			08/700,330	8 August 1996 (08.08.96)	US	08/700,331	8 August 1996 (08.08.96)	US	<p>(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).</p> <p>Published <i>With international search report. Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.</i></p> <p>(88) Date of publication of the international search report: 9 July 1998 (09.07.98)</p>
08/700,330	8 August 1996 (08.08.96)	US							
08/700,331	8 August 1996 (08.08.96)	US							
(54) Title: LIGHT DUTY LIQUID CLEANING COMPOSITIONS									
(57) Abstract									
<p>A light duty liquid detergent with desirable cleansing properties and mildness to the human skin comprising: at least one sulfonate surfactant, an alkali metal or ammonium salt of a C₈₋₁₈ ethoxylated alkyl ether sulfate anionic surfactant, a sultaine surfactant, an alkyl polyglucoside surfactant, and optionally a betaine surfactant, an amine oxide surfactant, an alkyl C₁₂-C₁₄ monoalkanol amide and/or an ethoxylated C₁₂-C₁₄ monoalkanol amide and water.</p>									

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INTERNATIONAL SEARCH REPORT

national Application No
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A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 C11D1/94 //C11D1:29,C11D1:92,C11D1:12,C11D1:66,C11D1:52,
C11D1:90,C11D1:75

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B. FIELDS SEARCHED

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IPC 6 C11D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

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☒ Patent family members are listed in annex.

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